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Before the  
Federal Communications Commission  
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF SECRETARY

In the Matter of

Amendment of Parts 2 and 15 of the  
Commission's Rules Regarding Spread  
Spectrum Transmitters

ET Docket No. 96-8  
RM-8435, RM-8608,  
RM-8609

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**REPLY COMMENTS OF CYLINK CORPORATION**

Cylink Corporation, by its attorneys, hereby submits its Reply Comments. Cylink urges the Commission to amend the spread spectrum rules to permit non-consumer point-to-point links to be operated in the 2.4 and 5.8 GHz bands with transmitter output power limited to no more than one watt but with EIRP to be determined by the antenna gain.

**I. Introduction**

As one of the country's leading developers of spread spectrum technology, in its opening Comments Cylink urged the Commission to continue to allow point-to-point links in the 2.4 and 5.8 GHz bands operated by governments, educational entities, medical organizations, and commercial firms at effective isotropic radiated power (EIRP) levels that would be determined by antenna gain with transmitter output power restricted to no more than one watt. Numerous parties familiar with the technology used to create such links and the publicly beneficial purposes

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served by the links agreed with Cylink in urging the FCC to continue to allow operations of this kind to be established.<sup>1</sup> Other parties objected to the use of directional antennas to create facilities operating with an EIRP of more than 6 dBw in the 2.4 GHz band, but not in the 5.8 GHz band.<sup>2</sup> While continued operation in both bands with more than 6 dBw EIRP is necessary if a variety of publicly beneficial needs are to be met efficiently, these Reply Comments primarily address operation in the 2.4 GHz band.

## **II. Continued Operation of Non-Consumer Point-to-Point Links in the 2.4 GHz Band Remains in the Public Interest.**

The market demands for and public benefits of medium and longer range (up to 30 miles) outdoor spread spectrum communications, operating under Part 15 rules, have been previously documented in this rule making and in the proceeding in ET Docket No. 96-102.<sup>3</sup> Rapid deployment and low administrative costs and procedures largely remove the barriers to wide bandwidth communications for educational, commercial, health care and public service

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<sup>1</sup>See *e.g.*, Comments of American Petroleum Institute; Gabriel Electronics, Inc.; Metricom, Inc.; Microwave Communications Technology, Inc.; Ocom Corporation; Oneonta Telephone Co., Inc., and North Alabama Cellular, L.L.C.; Infocomm, Inc.; Rural Cellular Corp.; Sola Communications, Inc.; U.S. Cellular Corp.; U.S. West New Vector; and Western Multiplex Corp.

<sup>2</sup>Cushcraft Corp.; Digital Wireless Corp.; ADTRAN; Wireless Consumer Section of TIA; and Rockwell International.

<sup>3</sup>Cylink Comments at 2 - 8; Cylink Comments in ET Dkt. No. 96-102 at 5 (July 15, 1996).

institutions.<sup>4</sup> These unlicensed wireless systems provide valuable communications facilities for campus-to-campus, building-to-building and access to NII facilities such as those of the Internet or related service providers. Such systems also offer a relatively inexpensive means for linking rural sites within an organization or to tie remote communities to other networks.

Over a dozen commenters favored higher power in both the 2.4 and 5.8 GHz bands to facilitate these uses. The primary objection to letting antenna gain be the limiting factor in establishing the EIRP for non-consumer point-to-point links focused on alleged interference incompatibilities. Those opposing higher EIRP to be determined by antenna gain in the 2.4 GHz band have speculated that such systems would be more likely to cause interference to wireless LANS operating in the band.

**A. Sound Engineering Practices for Non-consumer Point-to-Point Links will Minimize the Potential for Interference.**

The 2.4 GHz band can accommodate both wireless LANs and non-consumer point-to-point links. Western Multiplex showed that wireless LANs were more likely to cause interference to a non-consumer point-to-point link than vice versa.<sup>5</sup> Cylink has reviewed

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<sup>4</sup>Cylink uses the term "non-consumer" in describing the types of entities that would be eligible to deploy higher powered unlicensed point-to-point links in the 2.4 and 5.8 GHz bands. This would include government, educational entities, medical organizations and commercial users. Cylink urges the Commission to employ the same descriptor in order to resolve concerns voiced by those commenters that the term "commercial" could be so restrictive as to preclude institutional users such as government and education. *See e.g.* Metricom Comments at 5.

<sup>5</sup>Western Multiplex Comments at Attachment 1 thereto.

Western's Comments and agrees with this conclusion. Even if one were to assume 100 mW wireless LAN transceivers (versus the one watt used by Western Multiplex) adverse interaction between the two categories of systems is unlikely to occur for the reasons set forth below.

Before a reasonable user would deploy a point-to-point link, the user would perform a site analysis (and survey). This step requires that the prospective user of the Part 15 point-to-point system determine that the system, in fact, has reliable line-of-site from one location to another. It is extremely unlikely that one would expend the resources for a comparatively long range point-to-point system using the sort of narrow-beam directional antennas described by Cylink without first determining that a line-of-site path actually exists and that there are no nearby sites that would pose interference concerns.<sup>6</sup> This would include the presence of a nearby building of the sort posited by the Commission in the *Notice*.<sup>7</sup> It would also assess the likely radio noise environment at the site. Steps of this kind are necessary in order to guard against an improvident decision to install a link of doubtful utility.

Suppliers of the equipment used for non-consumer point-to-point links would not be in business long if they recommended that systems be installed in questionable interference environments. Nevertheless, some commenters have suggested that wireless LAN systems in the 2.4 GHZ band could be adversely affected by the deployment of high gain antennas. No such

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<sup>6</sup>A narrow beam directional antenna enhances the ability to engineer such paths and to avoid interference. Through increased range such antennas minimize the negative impact of constructing additional repeaters.

<sup>7</sup>*Notice of Proposed Rule Making*, ET Dkt. No. 96-8, 11 FCC Rcd 3068 (1996), ¶¶ 10 - 11.

instance has been experienced to-date by Cylink. Indeed, the typical limiting constraint is the interference generated by the wireless LAN to the point-to-point operation.

Western Multiplex has shown in its calculations that a wireless LAN point-to-multipoint system provides the potential for greater interference into a point-to-point outdoor system than a point-to-point system does into a point-to-multipoint wireless LAN. Cylink has modeled the same environment. Like Western Multiplex, the results show that emissions from wireless LANs provide harmful interference to point-to-point systems using high gain directional receiving antennas and that the attenuation factors of building walls and path losses result in the wireless LAN continuing to operate while the carrier-to-interference (C/I) ratio for the point-to-point system falls well below the margin necessary for establishing and maintaining connectivity.

The interference to a point-to-point system could well be more harmful than demonstrated in Western's example because most wireless LAN configurations would have multiple simultaneous emitters on differing LAN segments, adding to the radiated interfering energy picked up by the point-to-point receiver while not suffering any degradation themselves. Even at shorter path lengths between a point-to-point transmitter and a wireless LAN, the C/I margin is likely greater for wireless LANs in the presence of point-to-point high gain directional antennas because of the need for the point-to-point system planner to avoid nearby impediments to a clear line-of-site path.

Therefore, the construct and assumptions of the Wireless Multiplex attachment depict a link path situation that most likely would not be engineered for a point-to-point connection. Since an unlicensed wireless LAN can be installed in a building without any changes in exterior

appearance and without licensing or construction permits, professional outdoor communication path engineering must anticipate and preclude such interference effects in order safely to invest in the installation of Part 15 spread spectrum links and achieve highly reliable operations. Thus, it is virtually required to site outdoor high gain directional antennas so as to provide an unobstructed narrow beam path from the main lobe. This necessitates a location above surrounding terrain in order to clear intervening buildings, trees, hills and other natural or manmade structures, whereas the example presented by Western Multiplex assumed a worst case example of partial physical blockage by a building.

Hence, it is hardly surprising that opposition to removing the EIRP limitation on Part 15 spread spectrum operations in the 2.4 GHz band is unsubstantiated by experience. Such opposition does not address the primary uncontrolled contributor of harmful interference, namely Part 18 ISM devices. Nor does it consider real emitter spatial configurations for which proper point-to-point path engineering is required whenever wireless LANs are likely to exist.

**B. The Significant Potential for Noise from ISM Devices Supports the Need for Higher EIRP in the 2.4 GHz Band.**

Like the 5.8 GHz band, the 2.4 GHz band is an Industrial, Scientific, and Medical (ISM) band in which virtually unlimited amounts of radiated power are permitted for uses of radio frequency energy other than communications. While the most obvious use of the 2.4 GHz band is for millions of microwave ovens, new developments in energy efficient RF lighting for commercial areas including parking lots, outdoor walkways, and streets pose the prospect for significant increases in the noise level of the 2.4 GHz band. If non-consumer point-to-point links

are to remain a viable option for medium to long range paths, narrow beam directional antennas of the type recommended by Cylink must be used to generate effective radiated powers above the 6 dBw level.

In its Comments Fusion Systems Corporation asserts that its products "depend critically on use of the full 100 MHz bandwidth and on the 2450 MHz center frequency."<sup>8</sup> Fusion would have the Commission mandate susceptibility standards and avoid permitting the band to be used by those "not fully capable of co-existing on a secondary basis to ISM applications in all environments."<sup>9</sup> Permitting EIRP to be determined by antenna gain for 2.4 GHz non-consumer point-to-point spread spectrum links through the use of narrow-beam directional antennas stands out as the most straight-forward and efficient way of allowing the public to be served by unlicensed systems while sharing the spectrum with microwave lighting equipment.

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<sup>8</sup>Comments of Fusion Systems Corp. at 3 (June 18, 1996).

<sup>9</sup>*Id.* at 4. *See also* Comments of Fusion Lighting, Inc., at 3 (June 17, 1996). Because the world-wide applications of Fusion's microwave lighting systems include office areas, factories, parking facilities and residential environments, Cylink submits that ultimately (and in many cases currently), the noise floor will be most heavily affected by ISM equipment, rather than through Part 15 outdoor spread spectrum devices. In fact, manufacturers of indoor Part 15 communications products will most likely have to incorporate electronic intelligence in link and routing communications layers rather than depending upon "clean" physical spectrum, in order to attempt to achieve robust operations in an ISM environment.

### **III. To the Extent Possible, the Commission Should Refrain From Unduly Constraining Equipment Designers.**

While Cylink and others recognize that the use and authorization of external RF power amplifiers must be carefully regulated, many commenters correctly noted that other design constraints would limit manufacturers' efforts to meet legitimate requirements of users with little or no concomitant public benefit. The proposal to reduce output power by 1 dB for every 3 dB that antenna gain exceeds 6 dBi would preclude non-consumer point-to-point links in many situations because of a loss of range and/or reliability.<sup>10</sup> In those situations in which such links are needed most (e.g. rural areas), locations for additional relay stations are difficult to obtain. Moreover, the cost of added links may well render the service prohibitively expensive or delay its commencement.

Similarly, the proposed requirement for relative symmetry in the horizontal and vertical radiation patterns of directional antennas may have the undesired effect of compromising their use in certain situations.<sup>11</sup> Although the goal of reducing the likelihood of interference is worthy, neither the *Notice* nor those commenters in support of the proposal offer any evidence of the lack of such a requirement having led to interference.

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<sup>10</sup>Cylink Comments at 12. Market forces and the need to achieve frequency reuse should drive the technical choices on system design without the need for the proposed 1:3 requirement.

<sup>11</sup>*Id.* at 13. While many antennas already meet this requirement (Cushcraft Comments at 4), market forces and the need for flexibility in implementing systems should be the determinative factors in this aspect of system design.

The proposal to require proximity detectors to switch off systems if one were to come near the antenna also suggests a solution far more restrictive than other viable alternatives. Relatively high powered non-consumer point-to-point links are very unlikely to be installed in an environment in which those unaware of the RF energy present would wander into the field. Antennas for these links are typically installed atop or on towers or on masts atop buildings. These locations are no more likely to be frequented by uniformed visitors than are other communications sites. As such, the types of warning signs recommended by Cylink and others should provide the requisite level of protection.

Finally, the proposal to mandate that the antenna be authorized with the spread spectrum transmitter should be interpreted in a manner consistent with Section 15.203(a) insofar as non-consumer point-to-point systems that must be professionally installed are concerned.<sup>12</sup> Cylink systems are always installed by professional installers. Cylink provides training to its dealers in correct installation practices. This level of attention and care is necessary in order to deploy systems that meet the important requirements addressed by Cylink systems.

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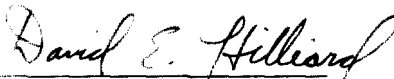
<sup>12</sup>Cushcraft at 4; Western Multiplex at 2. Section 15.203(a) of the Rules provides needed antenna flexibility in the case of equipment that must be professionally installed.

### **Conclusion**

This proceeding offers the opportunity to make some needed revisions to an otherwise commendable regulatory program. The Part 15 spread spectrum rules have proven to be an engine of innovation driving the development of highly flexible unlicensed communications technology that can economically and in a spectrum efficient manner address many worthwhile requirements. Cylink urges the Commission to continue to permit the deployment of non-consumer point-to-point links in the 2.4 and 5.8 GHz bands with EIRP to be determined by transmitter output power of not more than one watt with no limit on antenna gain. For several years systems of this kind have proven to be a viable solution to the problem of providing economical medium to long range data links that can be established rapidly. The public interest would be well served by maintaining this flexibility.

Respectfully,

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